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ABSTRACT

This report describes an interactive video program designed to help college biology students with their abilities to visually discriminate between instructional images, and to think critically about those images. A brief discussion of interactive video technology is provided, including details about videodisks, CD-ROM databases, computer software, and microcomputer controlled videodisc players. The interactive video program used in the study is then described as a Level III program which incorporates computer control on a videodisk player. This program allows the instructor, using computer software and a computer, to design science instruction that will put the student in control of both the pace and sequence of instruction. Small group instruction was chosen as the learning method, and questioning among the students was encouraged. Results of a student survey showed positive attitudes toward the program and an overall increase in improvement in both visual perception and thinking skills. Additionally, the completeness and substance of student answers to essay questions showed improvement. (20 references) (DB)

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Videodisc Technology to Enhance Visual Discrimination and Reasoning

by

Eunice R. Knouse

Paper presented the NISOD International Conference on Teaching Excellence, May 20-22, 1991

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"IDEODISC TECHNOLOGY TO ENHANCE VISUAL DISCRIMINATION AND REASONING

Presentation made by Eunice R. Knouse
to NISOD International Conference
On Teaching Excellence
May 20-22, 1991

Much has been made of the fact that young people today are very visually oriented. However, through personal experience during thirteen years of the teaching of introductory level sciences, I have become convinced, as have others, that one problem many students face is an inability to be visually discriminatory. Some students perceive the whole without recognizing the parts that make up the whole. Other students seem to see bits and pieces, perhaps because they are so used to the rapidly shifting images of MTV and advertisements, without comprehending the synergism of those bits and pieces. Consequently, at least on the introductory level, students need specific direction as to what to look for to make sense of what they see.

A related problem in science, as in any other discipline, is the importance of students' understanding the why and the how of events. It is not enough anymore simply to describe what an organism looks like or explain a sequence of events. Many students seem unable to transcribe these explanatory or descriptive words into an image that they can remember and manipulate; or at best, they "see" the overall effect without being able to visualize how it came to be or what caused it to happen. How many of you have asked your students to describe or explain, what to you is a logical sequence of events, only to have them respond with an answer that is disjointed or which omits important steps? You probably get the impression, as I sometimes do, that they're just reciting words, and as long as they're the right words, they believe the order doesn't matter. For years educators have been encouraged to incorporate a video system with appropriate visuals into their instructional delivery systems to help the students create that image in their own

minds that will help them see and remember the logical progression.

In the search for new and better ways to help students learn, strategies that lead to or foster analytical, logical reasoning and increased visual discrimination are essential. I have found that directed videodisc technology can be very helpful. With lessons designed to help the students compare and contrast, to help them see the logical progression of events, and to help them obtain an understanding of the parts as well as the whole, the pairing of computer and videodisc has been effective. What we're talking about is what's referred to as Level III interactive videodisc technology. Since it would be presumptious of me to assume that everyone in this room immediately knows what that is, and equally presumptious to assume that nobody knows what that is, allow me to briefly introduce the technology itself. For those who are already familiar with it, please bear with me.

The discs themselves--the oldest, but still most commonly used is the videodisc or laserdisc. It's large, shiny, holds approximately 100,000 images both still and with motion, usually the movie portions have narration, quite often in 2 languages, and it's virtually indestructable. Prices range from $30 to $1900. The one you see here is Optical Data's Life Science videodisc. It comes as a set of two, and the cost for this (purchased ~ a year and a half ago) with software was ~ $1300. Most educational ones are between $150 - $1200.

CD-ROM--it's newer, smaller (range is from 3 - 5 inches depending on the system you choose), and in certain areas and disciplines it is catching on very quickly. It has been particularly successful in libraries for databases, encyclopedias, reference books, etc. and for training people in everything from hotel management to professional interpersonal skills to truck driving. The prices here

range from $30 - $400.

Which of these will ultimately take the lead is anybody's guess. We are where Beta and VHS were several years ago. Only time will tell. The current evaluation of their advantages and disadvantages centers on digital vs. analog. The CD-ROM is completely digitized. As a result, still images are very good, but motion pictures are not. They lack smoothness and visual impact. On the other hand videodiscs use an analog signal for control. They have, as a result, extraordinary motion capabilities and almost unlimited possibilities.

The next step up--which is very new and may ultimately replace both videodiscs and CD-ROM--is called DVI, Digital Video Interactive Technology. This incorporates the digital convenience and accessibility of CD-ROM with the programming that allows easy access. There are still problems with motion pictures due to how the material must be processed, but hopefully these will be worked out.

The videodisc players--There is a wide range of available laserdisc players. Several companies make anywhere from 1 - 4 different models; however, Pioneer is definitely the leader. They produce 9 different models that I know of that range from players for home use, educational use and industrial use. A player can be purchased for under $500; however, a good, sturdy educational model will cost $900 to $1200. The one that I requested for use today is the one that I'm most familiar with. It is the Pioneer LDV2200 which was specifically designed by Pioneer for educational use. The last one we purchased was approximately 6 months ago and it cost $900. Of course, the top of the line is considerably more at $3500. For comparison, a VCR delivers 240 lines to the monitor, a laserdisc player delivers 350 lines, so the resolution is much better.

Level I and Level II are what you see right here--a videodisc player and a

monitor. Level II is a little more sophisticated than Level I because with the use of a bar code reader or a remote device you can jump around, search for a particular chapter or frame, repeat, step from one frame to the next, etc.

Some of you may be saying--We have videotapes, we have 16 mm films, we have slide projectors, what's so special about a videodisc? Well, one thing that's so special is RANDOM ACCESS. You have control of a nonlinear format.... Another beautiful feature of the videodisc is that you can choose exactly how much time you want to use. You have 100,000 images to choose from and you don't have to watch a 28 minute videotape to get the 3 minutes of video you really wanted your students to see at that time. This is the beauty of the videodisc.

Allow me to demonstrate. I'm using a remote device, with a bar code reader this would be even faster.

Level III interactive videodisc technology incorporates computer control on the videodisc player. Level III allows the instructor, using computer software and a computer, to design lessons that will then put the student in control--of both the pace and the sequence. If they wish to see something over again they can. They can stare at an image for as long as they need to. There is a variety of computers available to do this, IBM, Macintosh and Apple IIGS are the front runners in the computer side, although other such as Commodore and Tandy are making inroads. There are advantages and disadvantages to each and some of these center around the software.

The software is referred to as an authoring system. Some of you may have heard of or worked with Hypercard for the Mac. It, as do several others, provides the proper commands for integrating sound, text, and visual information. It can

draw from any medium and can link together external devices (such as video cameras). The disadvantages of this type of system is that it does require some programming ability, and it uses primarily multiple choice questions. The advantage is that, depending on a student's answer to a question, the lesson may progress along a variety of pathways.

For my students, I have chosen to pursue a slightly different approach at Level III because my aim, as I have said, was to attempt to design lessons that hopefully will foster analysis, logical reasoning and visual discrimination. Lavinia Kumar from Seton Hall University reported recently in the Journal of College Science Teaching on an experiment using videodisc tutorials in biology. Their system used tutorials with multiple choice questions to test the learning of a variety of biological concepts (88-89). Their conclusions were that students enjoy using the interactive videodisc, and that they, the students believe they are learning more: however, the amount of real learning that took place was questioned since students retained many misconceptions and some students even began to question what they thought they knew at the beginning. Ms. Kumar did go on to point out that learning may be "in progress" but had not had time to be incorporated into long-term memory and that motivation to learn was increased (89). In my opinion, the questioning that some of these students did was as important as their knowledge of the concepts because through questioning, they were attempting to reason out an answer, and at the very least it encouraged them to attempt to defend the answers they chose.

Even prior to reading this study, I had decided to write my lessons with open ended questions rather than multiple choice questions. In my opinion, multiple choice questions are not the best type of questions to lead students to

analysis and reasoning. These open ended questions quite often ask them to compare/contrast, provide reasons for their answers and/or draw conclusions. The lessons are on diskettes that contain the information for controlling the videodisc player. As a result, I had to give up one aspect of the videodisc system. that is, since their answers would not be typed in to the computer, the computer would not, of its' own accord, move to the next image. Now I'm about to ask you to do what I'm trying not to do with my students. I'm going to ask you to imagine my Apple IIGS computer sitting here. As you may know, an Apple IIGS is not very portable. The students sit near the monitor in groups of 5-7. Each student has a printed handout of the lesson events and questions such as the one you see here on this transparency.

I have chosen to use a small group format, which is of course, a learning method in itself. The students can get close to the monitor which increases the resolution even more. As opposed to using this for an entire classroom of students at a time, the students are more comfortable, they're more focused on what they're doing. I encourage them to interact, to help each other, to point out things on the screen, and I believe their questioning helps them analyze what is happening. As opposed to using this for individual study only, a recent study by Susan Cockayne on the effect of small group sizes on learning with the interactive videodisc pointed out that there was no significant difference in achievement between single learners, groups of 2-3, and groups of 4-5 (45). It should be noted that as the group size increased there was an increase in the amount of time spent. It's to be hoped that the increase in amount of time was time spent on interaction on the lesson.

A primary factor in the use of interactive videodisc, or for that matter any

audio-visual aid, is that it must be easily accessible for both the student and the instructor. No instructor is going to want to drag out a videodisc and player and monitor and computer to view one or two 2 minute videos no matter how good they might be. Delivery of the product must be routine and it must be as hassle free as possible. Now, I admit that I have an almost ideal situation because I teach science. Our videodisc stations are at the back of our labs and students rotate in and out during their laboratory times. This is one of the very few things I've been willing to give up lab time for. On your campus, or in your discipline, this may not be an option. Other relatively convenient situations would be a learning lab or media center or whatever your institution has designated for this type of technology. We are exploring the idea of expanding ours to a more central location; however, we haven't come up with an acceptable way to spur students to use it when it's not under our very eyes. Anyone who has any ideas about this, please let me know.

Does it help? I've been using the videodisc lessons as described for 3 semesters. I should point out that this was not designed as an experiment with control groups, etc. We decided to make this available to all students in our introductory biology classes. At the end of each semester, I ask my students to complete a survey on a variety of techniques and procedures that I've used in lab and lecture. To date, a total of 151 students have been surveyed. When asked to respond to the statement: "The videodisc lessons helped me to understand the information better." 92 (60.9%) agreed or strongly agreed. 28 (18.5%) were neutral, and only 30 (19.9%) disagreed or strongly disagreed (1 no response). When asked to respond to the statement: "The videodisc lessons helped me to know what to look for in class and lab." 85 (56.3%) agreed or strongly agreed, 34

(22.5%) were neutral, and 29 (19.2%) disagreed or strongly disagreed (3 no response).

I admit that when I first saw the survey results I was a little disappointed that only ~ 60% believed that it had helped them; however, I have to remind myself that 60% is a vast improvement over 0%, and that this percentage compares favorably with any other one learning method.

Perhaps more significantly, I have perceived a change that is harder to measure. My students, on the whole, are doing somewhat better on laboratory exams where questions are designed to evaluate whether they recognize the individual and collective structures, and whether they've properly analyzed experimental results. On essay questions in class, students do tend to improve from the beginning of the semester to the end; however, I've noticed a more dramatic improvement in the completeness and the substance of essay question answers for more of my students. Perhaps the videodisc lessons have been a part of this improvement. Unfortunately there are too many other variables that come into play to be absolutely sure.

Our system will continue to be evaluated, but after using this for a year and a half, my experience with it has been very positive. I believe that it is at least as effective as any other teaching method in enhancing reasoning, analysis and visual discrimination with the added advantages of flexibility, student control and learning through group dynamics. In an age where students seem to be more comfortable with images (even though they may not know how to fully use them) than with words, I believe this technology may be one way of bridging the gap.

Videodiscs are available in a number of different disciplines: art, sociology, history, political science, nursing, health related technologies, to name a few. If you'll take a look at the bibliography that was provided, I'll point out

a few of the references you might be particularly interested in looking into if you're interested in exploring this technology.

You may be interested to know that the Smithsonian Institution has set up a National Demonstration Laboratory for Interactive Videodisc Technologies in a portion of the Arts and Industries building.

QUESTIONS?

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